December 9, 1955

Dr. Joshua Lederberg
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Madison 6, Wisconsin

Dear Joshua:

Although we have prepared dextran in the molecular weight range you specified, we have not isolated such material. However, we do have a preparation with a M_w, weight average molecular weight, value of 16,500. A 10 gram sample of this material labeled "primer" dextran is being forwarded under separate cover to you. We have no information on the molecular weight distribution of this product. A 10 gram sample of acid hydrolyzed dextran from a commercial source, labeled "clinical" dextran is also being sent. This material meets current military specifications on molecular weight distribution of dextran for use as plasma volume expander. The M_w is in the range of 75,000 $\pm$ 25,000; the M_w of the lowest 5 to 10 percent fraction exceeds 25,000; and the M_w of the highest 5 to 10 percent fraction does not exceed 200,000. As will be noted, these are M_w values. The relationship between number average molecular weight, M_n, and weight average molecular weight, M_w, for materials of this type is approximately 0.6. That is, the M_n/M_w ratio is 0.6. Thus, a dextran sample with M_w of 75,000 would likely display a M_n value of about 40,000. Both dextrans are of the Leuconostoc mesenteroides NRRL B-512F type.

The refractive indices for dextran solutions of various concentrations can be computed from equation 1 (taken from Snyder et al. Jour. Res. Nat. Bur. Stand. 53: 131, 1954).

$$n_D^{20} = 1.33299 + 0.00151005p + 0.000006372p^2 \quad (eq.1)$$

where p is the number of grams of dextran in 100 grams of solution. The M_w has essentially no effect upon the refractive index.

The approximate densities can be calculated from equation 2 (also taken from Snyder, et al.)

$$d_{20°C} = 0.99717 + 0.00398133\,p + 0.00001597p^2 \quad (eq.\ 2).$$

The concentration of dextran in aqueous solutions can be conveniently estimated by polarimetry; we use an $[\alpha]_D^{25}$ value of + 200° for dextran in water. For precise measurements, the anthrone procedure for estimation of carbohydrates should be employed.

Dextran forms a gel; hence there is no "solubility" value. Possibly more useful to you may be the concentration of dextran solutions that can be prepared. No difficulty has been encountered in making 12% solutions with clinical dextran samples. We are reasonably certain that solutions of up to 30 percent could be prepared. We suggest you make a paste or slurry of the material, make up to volume in a good sized container, autoclave the material at 121° C for a few minutes, remove the sample from the autoclave, and stir while hot.

We have no viscosity data for solutions with high concentrations of dextran. Despite the fact that the viscosity vs. concentration curve skews upwards, the clinical dextran may meet your requirement of the viscosity being less than 100 times the viscosity of water. This opinion is based on viscosity measurements of 8 percent solutions of clinical dextran. The experimentally found viscosity of these dextran solutions was only 2 1/2 times that of water.

You have inquired about the availabity of dextran should either of these samples prove useful for your purposes. We have only limited amounts of these products on hand, but we may be able to send you a little more of each depending upon your requirement. If we cannot furnish you the amounts required, we suggest you write to:

Dr. H. E. Stavely, Head
Division of Pharmaceutical Chemistry
Commercial Solvents Corp.
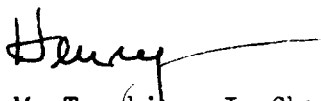Terre Haute, Indiana

or

Mr. J. T. Wolf, Plant Manager
Chemistry Division
R. K. Laros Company
Bethlehem, Pennsylvania

The latter may be more likely to have the lower molecular weight materials. If you wish to do so, you may mention the fact that we have suggested you contact them.

We hope the above information and samples will be of use to you. If we can be of further assistance, please let us know. It was a pleasure to visit with you; we appreciate your kindness in sending us the reprints we requested. With best regards, I am

Very truly yours,

H. M. Tsuchiya, In Charge
Microbiological Technology of Polymers Unit
Fermentation Section